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♦EPA Draft Technical Assistance Document (TAD) for Delineating "Other Sensitive Ground Water Areas"

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I. Introduction

A. Scope and Purpose of this TAD

Under Section 1453 of the 1996 SDWA Amendments, States are required to ensure that source water assessments are completed for all public water systems by the year 2003. These assessments will include both ground and surface water sources, and require three main components: delineation of source water protection areas, inventory of potential contaminant sources in the delineated protection areas, and determination of susceptibility of the water systems to contamination. Upon completion of these steps, the results of a source water assessment must be made available to the public. (A local source water assessment is considered completed when the results of the assessment are made available to the public).

The Revisions to the Underground Injection Control Regulations for Class V Injection Wells (hereinafter referred to as "the Class V rule" for purposes of this TAD) regulates existing motor vehicle waste disposal wells in areas critical for the protection of ground water. Initially, the implementation of the Class V requirements for existing motor vehicle waste disposal wells are linked to local assessment areas for community and nontransient non-community water systems that use ground water as a source. The Class V Rule uses the term "ground water protection areas" to identify community and nontransient noncommunity water systems covered by the Rule.

In addition, States may delineate other sensitive ground water areas (OSGWAs) that require additional protection from motor vehicle waste disposal wells. These other sensitive ground water areas are critical in the protection of underground sources of drinking water (USDW) from contamination, but are not designated as ground water protection areas as specified in the Class V rule. These areas may include highly productive aquifers that supply transient non-community water systems (as delineated as part of the State Source Water Assessment and Protection Programs), private wells, areas overlying sole-source aquifers, aquifer recharge areas, karst aquifers, or other hydrogeologically vulnerable areas.

The purpose of this TAD is to provide States with options for identifying and delineating OSGWAs where these wells may endanger USDW. Exercising the option to identify and incorporate these other sensitive areas for purposes of the Class V rule can be of great benefit in targeting a State's resources and strengthening the overall approach to comprehensive drinking water source protection.

We recommend that persons using this TAD familiarize themselves with both the Class V rule requirements applicable to motor vehicle waste disposal wells, as well as the provisions of the EPA-approved Source Water Assessment and Protection Program for their respective State.

B. Linkages between Class V wells and Sensitive Ground Water Areas

A ground water protection area is a geographic area near and/or surrounding community and non-transient non-community water systems that use ground water as a source of drinking water. These areas receive priority for the protection of drinking water supplies and States are required to delineate and assess these areas as part of their State Source Water Assessment and Protection Programs. In other words, the Class V rule uses the term ground water protection areas, which are the same as source water assessment areas, source water protection areas, and ground water areas delineated and assessed under Section 1453 of the SDWA for community and non-transient non-community water systems that use ground water as a source of drinking water.

The new Class V requirements as finalized apply only to owners and operators of existing motor vehicle waste disposal wells in two areas:

- (1) completed local assessment areas of ground water protection areas under the State Source Water Assessment Programs, and
- (2) delineated other sensitive ground water areas

In each State's EPA-approved Source Water Assessment and Protection Program, a detailed description of the delineation approach of ground water protection areas is presented. In many States, the delineation approaches for these areas are the same as their approved approaches in delineating wellhead protection areas. In cases where the State delineated zones or areas representing various levels of protection, the State will need to determine which areas correspond to ground water protection areas for the purpose of the Class V Rule.

The Class V Rule does not explicitly include source water protection areas of transient non-community water systems that use ground water as a source. Apart from community and non-transient non-community water systems, as a part of the State Source Water Assessment Program, each State is required to complete assessments of all transient non-community water systems. Although the source water protection areas delineated for ground water-based transient non-community water systems are not included in the ground water protection areas as defined under the Class V rule, these areas may well be included in "other sensitive ground water areas," if determined to be appropriate by the States.

C. <u>Decision to Identify and Delineate OSGWAs</u>

In the final Class V Rule, the requirements for motor vehicle waste disposal wells are expanded to other sensitive ground water areas as designated by the States, or in the case of direct implementation (DI) Programs, the EPA Regional Offices. Expanding the rule to other sensitive ground water areas will give States the flexibility to identify areas, in addition to ground water protection areas, that require additional protection from endangering wells. The addition of these areas in the rule gives States authority (if it does not exist in current State statute or regulation) to protect other important aquifers from potential damage by motor vehi-

cle waste disposal wells located in areas outside of ground water protection areas. Other sensitive ground water areas would then be protected through implementing rule requirements for closure or permitting of motor vehicle waste disposal wells. (The reader is referred to Chapter 6 of EPA's Implementation Manual for the Class V rule for an expanded discussion of these permitting and closure requirements).

If determined to be unnecessary, a State has the flexibility not to delineate other sensitive ground water areas for a variety of reasons. Such a decision must be reflected in the primacy revision application. A State may decide not to delineate additional sensitive ground water areas for a variety of reasons that include:

Existing statewide ban of motor vehicle waste disposal wells. New statewide ban of motor vehicle waste disposal wells (through revised rules).

Absence of motor vehicle waste disposal wells across the state. The entire State consists of sensitive ground water areas.

The State should be aware that if the decision is made not to delineate OSGWAs, all motor vehicle waste disposal wells in that State will then be required to either close or seek a waiver from the ban and obtain a permit by January 1, 2007, without exception.

D. Submission of Plans for Identifying and Delineating OSGWAs

Given that this component of the Class V Rule is not tied to the State Source Water Assessment and Protection Programs, the UIC Programs at Primacy States and EPA Regions (for DI States) will be responsible for completing the delineation of other sensitive ground water areas. First, the States, and the EPA Region for DI States, must develop a plan for identifying other sensitive ground water areas. The plan would include:

- Identification of certain geologic conditions such as karst, fractured bedrock, and unconsolidated aquifers.
- Identify legal designations such as sole source aquifers.
- Criteria that will be used for excluding areas, such as the depth to ground water, confining layers, and likelihood of ground water use.
- Public participation.
- Description of how the results and information will be made public.

The plan for delineating other sensitive ground water areas is required as part of a State's primacy revision package and must be approved by EPA. The primacy revision, including the plan for delineating other sensitive ground water areas, must undergo a public review and comment process before being approved by EPA. Upon approval by EPA, the State will

have until January 1, 2004 to complete the delineation process, unless the State applies and receives an extension to complete the delineation by January 1, 2005.

In the case of DI programs, the EPA Regions should work with the State to complete their plans for delineating other sensitive ground water areas and make them available for public comments by December 29, 2000. A public notice should be published in the Federal Register regarding the plan. The EPA Regions will then work with DI States to complete the delineations by the January 1, 2004 deadline. In order to give States the maximum flexibility, EPA will encourage State agencies with DI programs to do the delineations themselves. EPA will provide technical assistance to the States and/or enter into a Memorandum of Understanding with the States in developing the plans and conducting the delineations of other sensitive ground water areas.

E. Coordination with Other Programs and the Public

1. Completion of Source Water Assessments

For States with Primacy in both the Class V UIC and Drinking Water Programs, the UIC Program should work closely with the State Source Water Assessment Program to ensure that the results of local assessments are made known to the UIC Program and made available to the public. Information exchange between the UIC and Source Water Assessment Programsis essential to facilitate the implementation of the Class V Rule.

For States with Primacy in the Class V UIC Program but not the Drinking Water Program, the State UIC Program should coordinate with EPA to ensure that the results of local source water assessments are made known to the State UIC Program and the public in a timely manner.

For States with Primacy in the Drinking Water Program but not the Class V UIC Program, the EPA Regional Office will need to work closely with the State Source Water Assessment and Protection Program to ensure that the results of local assessments are made available to EPA and the public in a timely manner.

Although the results of local source water assessments will be made available to the general public by the Source Water Assessment and Project Program, there is no guarantee that the information will reach the affected motor vehicle waste disposal well owners and operators in a timely fashion. Therefore, upon the completion of a local source water assessment for a ground water protection area, the UIC and the Source Water Assessment and Protection Programs should coordinate to notify owners and operators of motor vehicle waste disposal wells that have submitted an inventory to the UIC program administered in the ground water protection areas, regarding their responsibilities in meeting the Class V Rule requirements. In addition, outreach programs through trade organizations, building and plumbing inspectors, and local watershed associations can be used to make well owners and operators aware of their compliance requirements.

2. Delineation of OSGWAs

For States with Primacy in the Class V UIC Program, the UIC Program should work with other appropriate State agencies (e.g., State Geological Surveys and State Drinking Water Program) to develop the plans for delineating sensitive ground water areas (i.e., assuming the UIC program and the drinking water programs are in separate agencies or offices). It is also important to use experiences gained from the process of susceptibility determination (a part of the source water assessment process) to develop the delineation approach for sensitive ground water areas.

For DI States, EPA will work with the States to develop plans for delineating sensitive ground water areas. In addition, EPA will encourage DI States to conduct the delineations on their own. EPA may provide technical assistance to the States and/or enter into a Memorandum of Understanding with the States in developing the plans and conducting the delineations of other sensitive ground water areas. If a State decides not to take on the responsibility of preparing a plan and conducting the delineations, the EPA UIC program will be responsible for meeting the various deadline.

Upon the completion of the delineation of other sensitive ground water areas, the UIC programs should make the delineation results available to the public and affected well owners and operators in a timely fashion. Outreach efforts should be targeted to affected well owners and operators regarding their responsibilities in meeting the Class V Rule requirements. In addition, outreach programs through trade organizations, building and plumbing inspectors, and local watershed associations can be used to make well owners and operators aware of their compliance requirements.

F. Where to Go for More Information

- HOTLINE: EPA operates the Safe Drinking Water Hotline [1-800-426-4791] which can answer questions about the regulations and programs developed under the Safe Drinking Water Act, and provide federal and state contacts for specific information. It can also provide information on drinking water publications.
- INTERNET: EPA's drinking water web site [www.epa.gov/safewater/] provides information on EPA's implementation of SDWA, the contaminants regulated under SDWA, educational activities and publications on drinking water, links to other drinking water web sites and much more.

II. Developing a Plan to Identify and Delineate OSGWAs.

If you choose to implement the rule to include delineation of these areas, your modified program description included in your primacy revision application must include a description of, and a schedule for, the plan to identify and delineate these areas in your State.

40 CFR 145.23(f)(12) provides items that States are expected to consider in the plan and its implementation, including:

- geologic and hydrogeologic settings,
- ground water flow and occurrence,
- topographic and geographic features,
- depth to ground water,
- significance as a drinking water source,
- prevailing land use practices, and
- any other existing information relating to the susceptibility of ground water to contamination from Class V injection wells.

The following outline the description of plan elements:

- Identify Sensitive Geologic Conditions -- This section of the plan should include methods you will use to identify geographic areas in which Class V wells may penetrate or otherwise impact aquifers in areas such as karst, fractured bedrock or other shallow/unconsolidated aquifers.
- Identify Legal Designations -- This portion of the plan should discuss the criteria you will use in identifying aquifers or portions thereof that would be legally designated in your state, including sole source aquifers. Sole source aquifers are valuable resources that will need to be included in other sensitive ground water areas, if it is not fully protected through delineations of ground water protection areas in your State.
- Criteria used for Exclusion/Considerations for Final Designation of Other Sensitive Ground Water Areas -- A variety of factors could influence your decisions to include or exclude an area. You may want to consider: the depth to ground water; the likelihood of use of the ground water resource; and the presence or absence of confining layers that may protect the USDW.
- Public Participation -- As part of the primacy revision package your plan for designating other sensitive ground water areas will undergo public participation.
 Public participation may include stakeholder meetings, statewide publication with opportunity to comment, public meetings, or other means.
- Plan for Making Designations Known to the Public -- Once the designations are completed, it is critical that the public be aware of the delineations. You can use

the same plan that was developed by your State's source water area protection program, or you may want to refine that somewhat. However, we believe the plan developed in the source water program will provide a good starting point for your use.

The rule specifically states that your plan must include a commitment from your State to:

- Complete all delineations of other sensitive ground water areas by January 1, 2004,
- Make the delineations available to the public after they are complete, and
- Implement the new Class V regulations in the delineated sensitive ground water areas by January 1, 2007.

A primacy revision package that does not include a plan for the delineation of other sensitive ground water areas will be considered incomplete unless the State specifically states in the application that it does not intend to exercise this optional process. Also, the motor vehicle waste disposal well requirements of the Federal rule will then apply to all owners and operators as of January 1, 2004, and they will be require to fully comply with the rule by January 1, 2007.

III. Delineating "Other Sensitive Ground Water Areas"

The requirements for existing motor vehicle waste disposal wells are being linked with State Source Water Assessment Programs. Owners and operators of motor vehicle waste disposal wells in ground water protection areas (GWPAs) must close their wells or obtain a permit within one year of completion of the States's local assessment for GWPAs. (States could grant a one year extension under certain conditions).

The Class V Rule considers the ground water protection areas (GWPAs) of all community and non-transient-non-community (NTNC) public water supply (PWS) wells to be sensitive. States may also identify other sensitive ground water areas (OSGWAs) in which the Class V Rule will be implemented.

The intent of this document is to help states identify those other areas where USDWs (that is, aquifers or systems of aquifers that are currently, or have the potential to be, used as a source of drinking water) are sensitive to contaminants that can be released from motor vehicle waste disposal wells. (For the purposes of this document, an aquifer is defined as including not only the saturated, but also the unsaturated, portion of a water-bearing geologic unit or sequence of units.)

This document focuses on areas that are hydrogeologically sensitive, but also addresses the designation of areas as sensitive, based on the high valuation of the ground water. These latter areas could include: all, or portions of, sole-source aquifer areas; areas with transient

community wells and/or clusters of domestic wells; and areas that contribute baseflow to streams or reservoirs that supply, or may in the future supply, public drinking water.

This section presents: 1) a discussion of how states can identify broad sensitive areas, 2) the hydrogeologic, and other, criteria ("mitigating factors") that can be applied to refine and "fine tune" these broad areas to reduce their size, and 3) a process for arriving at a final selection of OSGWAs. States will need to balance the benefits of delineating smaller, more fine-tuned OSGWAs that limit the geographic areas of responsibility for implementing the motor vehicle waste disposal well requirements, with the relative ease and greater protectiveness of delineating broad OSGWAs.

Each state has the option of not identifying OSGWAs. However, if a state chooses to not identify these areas, then the requirements for motor vehicle waste disposal wells apply statewide.

Designation of OSGWAs is described below. For the purpose of discussion, OSGWAs are categorized into three broad types: aquifer areas, areas with transient non-community or domestic drinking-water wells, and areas supplying ground water to surface water supplies of public drinking water

A. Areas Relative to Underground Sources of Drinking Water (USDWs)

Contamination of a portion of a USDW can occur when motor vehicle wastes percolate to a USDW, or when wastes, already in a USDW, expand laterally within it. This TAD addresses only downward percolation of motor vehicle waste to a USDW. (Note: In the very rare instances of deep Class V wells, states are directed to the document "Regional Assessment of Aquifer Vulnerability and Sensitivity in the Coterminous United States" [EPA/600/2-91/043] for state maps showing aquifers and portions of aquifers whose transmissivity makes them sensitive/vulnerable. However, in almost all cases, motor vehicle waste disposal wells penetrating a USDW cause an endangerment to the USDW and should be closed. [Although not linked to the purpose of this Class V Rule, states may find EPA/600/2-91/043 helpful in identifying areas where existing contaminants are most likely to spread laterally.)

1. Aquifer areas

The identification of sensitive aquifers is perhaps the most critical concept in this guidance. That is, although some areas may be deemed sensitive for regulatory reasons, or for reasons related to the relative value of the ground water, they may not, in actuality, be likely to become contaminated by the discharge from motor vehicle waste disposal wells. On the other hand, some areas are prone to contamination by these wells, solely as a result of the nature of the underlying aquifer.

Highly permeable aquifers are particularly at risk of contamination. This risk results from the ease with which contaminant-laden water can percolate downward from

the motor vehicle waste disposal well to the saturated zone. Various natural factors can mitigate the likelihood of contaminants reaching the saturated zone. These factors will be discussed below, in the sub-section "Mitigating factors".

States that decide to identify OSGWAs may choose to begin by identifying aquifer areas. The Class V Rule lists karst, fractured volcanics and unconsolidated sedimentary aquifers, such as glacial outwash deposits and eolian sands, as examples of aquifer types. The EPA urges states to consider all aquifer types that, based on their inherent characteristics, are likely to be moderately to highly sensitive. Such aquifer types are those that potentially have high permeability, such as: all fractured aquifers; all porous media aquifers with a grain size of sand or larger, including not only unconsolidated aquifers, but sandstone as well; and karst aquifers. State implementing agencies will need to discuss the selection of sensitive aquifer types with their technical staff and/or with professionals at such agencies as the state or federal geological surveys.

State and federal geological surveys have numerous geological maps and technical reports that can be helpful in the identification of areas of sensitive aquifers. University geology and earth science departments and consulting company reports may also have helpful information. Because most states maps are likely to depict very generalized hydrogeologic information, probably the best place for the Class V implementing agency to begin obtaining information, is the generalized geologic maps available for many states. Consultation with hydrogeologists or geologists at the state and federal geological surveys, can help interpret and refine the geological maps, especially to identify areas where mitigating factors reduce the permeability of aquifers (see sub-section "Mitigating Factors", below).

a. Mitigating factors that could reduce the size of sensitive aquifer areas: hydrogeologic factors

Contamination results from vertical movement of water and contaminants from the well to the saturated zone. Large conduits such as well developed fractures or karst features, or large, well-sorted sediments, can provide rapid pathways for contaminants to reach the saturated zone of an aquifer (Figure 1). Therefore, any factors that slow, or filter, or expose to natural remediative processes, contaminated water discharging from a motor vehicle waste disposal well potentially serve as a mitigating factor. Although all aquifer types have the potential to become contaminated by motor vehicle waste disposal wells, mitigating factors such as a confining unit above the aquifer, may exist that reduce the likelihood of such contamination. Other factors include: depth to ground water; that has poorly developed, poorly connected and/or very fine fracturing; or that is of small grain size, or has poor sediment-size sorting and/or high silt/clay content.

It is important to recognize that the threshold values for the effectiveness of mitigating factors (for example, thickness of a confining unit, or depth to ground water) are generally unknown. Additionally, threshold values will vary from

location to location. For example, an unsaturated zone "x" feet thick may be protective of the aquifer in some settings, but not in others. State agencies implementing the Class V Rule will likely need to confer with technical professionals while selecting mitigating factors and threshold values.

Where aquifers are thin, fined grained, poorly sorted by grain size and/or clayey/silty, they tend to have low productivity, another mitigating factor,

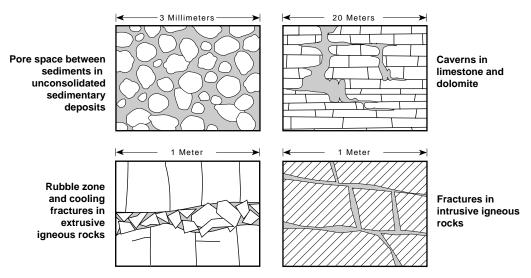


Figure 1. Types of Openings in Selected Water-Bearing Rocks

b. Mitigating factors: political

If a state chooses to delete a portion of a sensitive aquifer from consideration as an OSGWA, based on other-than-hydrogeologic criteria, the criteria that could be used include: population density served in different areas of the aquifer, land use, potential commercial/industrial development, etc.

2. Sole Source Aquifers (SSAs)

Some states may choose to designate a SSA as sensitive, for the sole reason that, by definition, an SSA contains highly valued ground water. If a state chooses to designate only a portion of the SSA, the state will need to select and identify the criteria by which to "filter out" the non-sensitive portion of the SSA.

a. Mitigating factors: hydrogeologic

If a state chooses to identify as sensitive, only those portions of the SSA that are hydrogeologically sensitive, the approach for filtering out less-sensitive areas is that used for filtering out less-sensitive areas of highly permeable aquifers (see III A1a, above).

b. Mitigating factors: political

If a state chooses to designate a portion of an SSA based on other-than-hydrogeologic criteria, the criteria that could be used include those identified in III A1b, above.

3. Aquifer Recharge Areas

Recharge areas of unconfined aquifers will likely be difficult to distinguish from aquifer discharge areas. Where this difficulty exists, hydrogeologic studies or consultation with technical experts on staff or in, for example, the state or federal geological surveys (see Appendix X for contact numbers) will be necessary. Identification of recharge areas of confined aquifers may be easier, will still require technical consultation.

a. Mitigating Factors

In most cases, it will be difficult for a state to declare that recharge areas are not sensitive. States may, however, be able to identify factors that support the state's decision to not designate a recharge area as an OSGWA. These factors might be hydrogeologic, for example, low productivity of the aquifer, or very long ground water travel time to any area likely to have, or to develop, drinking water wells. Factors may also be political, for example, very low population density, or land use that precludes development of drinking water wells..

B. Areas Associated With Transient Non-community (TNC) Public Water Supply Wells or With Domestic Water Supply Wells

Although the Class V Rule does not defines transient non-community PWS wells and the area of ground water contribution to domestic drinking water wells as sensitive. However, states may want to designate as OSGWAs, the source water contribution area for such wells.

1. Transient Non-Community PWS Wells

The source water assessment area of TNC wells will be delineated as part of a state's source water protection (SWP) program. Additionally, the 1997 SWP Program Guidance gives states the option of designating "area-wide source water protection areas", where numerous ("clusters") PWS wells are located in the same hydrogeologic setting. For the purpose of the Class V Rule, states could, in an analogous fashion, identify as sensitive, individual TNC wells and/or those areas with numerous TNC wells in the same hydrogeologic setting.

a. Mitigating Factors

If states choose to fine-tune the initial area-wide assessments for TNC PWSs, hydrogeologic mitigating factors could be applied. The factors could include those discussed above in III A1a. Additionally, a state might wish to fine-tune by considering other-than-hydrogeologic factors, such as those discussed above in section III A1b.

2. Areas of Domestic Wells

The ground water contribution area for domestic wells is not addressed in the Source Water Protection (SWP) program. Therefore, assessments will not be completed for this type of well. However, some states might want to identify areas of domestic wells, in a manner analogous to area-wide delineations for TNC PWS wells. A state could define areas containing numerous domestic wells as OSGWAs. Because the discharge of domestic wells is low, the boundary of such an OSGWA might only be tens of feet from the outermost domestic wells in the cluster.

a. Mitigating Factors

Hydrogeologic mitigating factors could include those discussed above in III A1a. Additionally, a state might wish to consider other factors, such as those discussed above in section III A1b.

b. Individual domestic wells

States also have the option of designating as an OSGWA, the contribution area about an individual domestic well. However, the small size of the ground water contribution area combined with the lack, or imprecision of, locational information for these wells, would likely render the mapping of these OSGWAs of little protective value.

C. Areas supplying ground water discharge to surface water supplies of drinking water.

The areas of ground water contribution to hydraulically connected surface water underlie and border rivers, lakes and reservoirs.

Protection of PWS surface-water intakes should recognize that ground water, via baseflow to streams, is generally a component, possibly a major one (and during some parts of the year, possibly the only component), of streamflow (Figure 2).

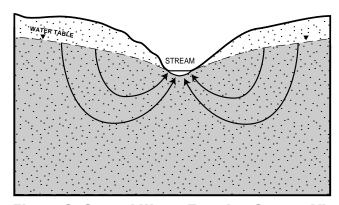


Figure 2. Ground Water Entering Stream Via Baseflow

As a result of the relationship between ground water and surface water, states may be concerned about the quality of ground water that discharges to streams or reservoirs that supply, or may in the future supply, water to public water supply intakes. States may choose to designate all, or some portion of, the ground water discharge area as an OSGWA. The difficulty that accompanies the identification of the boundary between recharge and discharge areas may confound the designation of discharge areas as OSGWAs in the absence of hydrogeologic studies. However, numerous options exist for a "managerial" decision regarding the area to be so designated. These options are identified in the EPA document "Delineation of Source Water Protection Areas, A Discussion for Managers, Part 1: A Conjunctive Approach for Ground Water and Surface Water, EPA 816-R-97-012, October 1997".

- Floodplain boundary setback for perhaps the 20-, 50- or 100-year flood. However, the extent of the floodplain is not related to the areas through which ground water contributes to surface water.
- Hyporheic zone boundary setback; this zone may be defined by specific biological or physical parameters. The boundary of this zone can vary, depending on the defining parameter used. The size of the zone can vary seasonally and in response to droughts; where biological parameters are used, the extent of the zone may depend on how rapidly the microorganisms recolonize.
- Ground water travel time (figure 3) and fixed distance setbacks rely on the ability of soil and rock to improve water quality with time and ground water travel distance. Given the current level of knowledge, specific distances needed for sufficient in-situ remediation are generally unknown. These approaches are

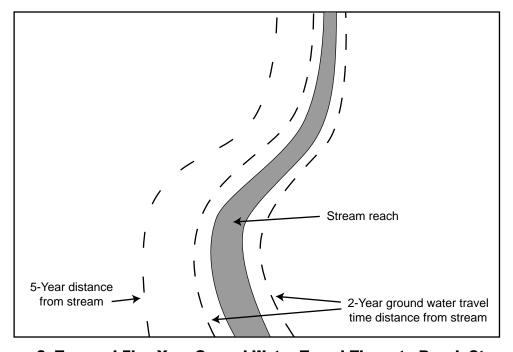


Figure 3. Two and Five Year Ground Water Travel Times to Reach Stream

- analogous to the travel-time and fixed-distance approaches used in the SWPP and Wellhead Protection programs for wells.
- Ground water basin boundary: the position of this boundary marks the furthest locations from which ground water will flow to a stream or other drain. The position of the boundary may vary seasonally and with climatic changes. The position of the boundary is often assumed to coincide with the position of the watershed boundary. While this assumption is not always true, it may be a sufficiently reasonable assumption for the purposes of the Class V Rule for most settings except karst.

D) Process for identifying OSGWAs

This subsection provides a process States can use for identifying OSGWAs. This process can be stopped at any step. Additional steps will provide smaller, more fine-tuned OSGWAs. Smaller OSGWAs are more costly, may be less protective and more difficult and time consuming to delineate than broader OSGWAs, but once delineated, they allow states to limit the geographic areas of responsibility for implementing the motor vehicle waste disposal well requirements.

<u>Step One: Selecting Criteria to Identify Inherently Sensitive Areas</u>
In this Step, States decide which types of hydrogeologic and/or political features it considers inherently sensitive. It is these features that, when mapped, will constitute the broad, first-round delineation of OSGWAs.

Hydrogeologic features:

States may identify the aquifer types within their boarders that are inherently sensitive. States should consider including: sandstone aquifers, karstic aquifers, fractured aquifers and all, but very fine grained, unconsolidated aquifers. States should also consider identifying highly productive aquifers as sensitive.

Political features:

States may identify the political/regulatory features that are considered inherently sensitive. Political features may include regulatory areas, areas of highly valued water, areas of high-population density, etc., that could be adversely impacted by the presence of motor vehicle waste disposal wells. For example, many states will likely include SSAs in their list of inherently sensitive political features.

Step 2: Delineation of Broad Inherently Sensitive OSGWAs

States map the selected features identified in Step 1; that is, the boundaries of all inherently sensitive areas are drawn on a base map. State-wide geologic or hydrogeologic maps exist for many states and would be available from the state or federal geological survey. Using a geological map as the base map will likely be easier than transferring geologic information to another base map.

Identification of inherently sensitive hydrogeologic features on geologic or hydrogeologic maps will likely require the assistance of staff professionals or geological survey professionals.

All SSAs have been mapped. Maps are available from______. Delineation of other political features, such as areas of high population density, will likely need the cooperation of sister agencies.

Step 3: Selection of mitigation factors

States identify, in consultation with experts in such fields as city planning, resource management and hydrogeology, the critical factors that will allow the fine tuning of the broad OSGWAs developed in Step 2. Among the criteria most likely to be considered are:

Technical--

- confining units above the aquifer
- depth to ground water
- area is/is not an aquifer recharge area
- area is/is not a source of ground water discharging to a surface water body that supplies, or in the future may supply, a PWS intake
- aquifer productivity

Non-technical

- land use
- likelihood of commercial/residential/industrial development
- low population density
- significance of the aquifer as a drinking water source in the area.

Step 4: Second-round delineation of OSGWAs

Consideration of the mitigating factors selected in Step 3 most likely will result in portions of the initial OSGWAs no longer being considered sensitive. These areas are deleted from the base map. The areas that remain are the second-round OSGWAs.

Step 5: state decides whether to continue the refinement process

The state evaluates the second-round OSGWA map and decides if the second-round map provides appropriately protective areas. The has state two choices:

- The map provides appropriately protective OSGWAs. The OSGWA selection process ends.
- The map provides OSGWAs that cover a large portion of the state. The state identifies additional mitigating factors,

repeats steps 3 and 4, and decides if the next-round OSGWA map provides manageable OSGWAs.

Step 6: The "DO LOOP" continues

For those states that selected the last choice in Step 5, the process of adding additional refinement continues until the state decides whether to use the refined OSGWAs or to not differentiate between OSGWAs and non-OSGWAs.

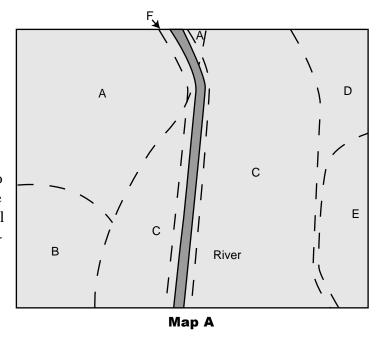
E. Examples of the OSGWA-identification process

Attached are the case studies of hypothetical states applying the OSGWA-identification process described above.

CASE STUDY: HYPOTHETICAL STATE A

Introduction

State A (Map A) consists of six "sensitivity features". These have been identified by technical experts in the Class V implementing agency, in consultation with the US Geological Survey. There is no state wide geologic map for the state and therefore the state will transfer information from existing maps and "fill in" generalized aquifer boundaries where needed through consultation with the state and federal; geologic surveys.



- Zone A consists of a vertical sequence of poorly fractured, low productivity aquifers, the shallowest of which has a deep water table.
- Zone B is an SSA consisting of moderately karstified limestone.
- Zone C is a highly productive, confined aquifer of alluvial sand and gravel.
- Zone D is the outcropping recharge area for the sand and gravel aquifer of zone C.
- Zone E is hydrogeologically the same as Zone D, but is a state park with primitive camping only, virtually no development and a very low population density.
- Zone F is alluvial sediments associated with the modern river that flows north-south through the center of the state. The river has cut through the confining layer of zone D and most of the river's alluvium rests directly on the underlying aquifer. Only the edges of the alluvium lie on the confining unit.

The state has chosen to not separately delineate the area of ground-water recharge to the river.

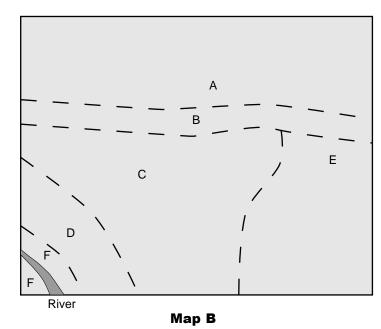
Process

- <u>Step 1</u>: The implementing agency selected the features that it considered sensitive: SSAs, karstic aquifers, and coarse-, or moderately coarse-grained unconsolidated aquifers.
- <u>Step 2</u>: The state will then select mitigating factors.
- Step 3: Mitigating factors
 The state identified confinement and the presence of a deep water table as the two primary factors that remove features from consideration as an OSGWA.
- Step 4: After discussion with, and assistance from, technical professionals, the state cobbled together an OSGWA map, based on the mitigating factors selected in step 2. This revised OSGWA map contains Zones B, D, E, and F. These zones cover about 30% of the state, however, the state park accounts for about one third of this area, and it has only two motor vehicle waste disposal wells, which the state is already in the process of closing.
- <u>Step 5</u>: The state decides that the OSGWAs identified in Step 4 will be the final OSGWAs to satisfy the requirement of the Class V Rule.

CASE STUDY: HYPOTHETICAL STATE B

Introduction:

State B (Map B) consists of seven hydrogeologic settings. These settings were identified through discussions with the state geological survey. A 1:250K geologic map is available for State B. This scale allows the identification of major geologic features only. However, these major features are sufficient for the implementation of the Class V Rule.



- Zone A is an outcrop area of consolidated sandstone. The water table is shallow.
- Zone B is a finely fractured, low productivity aquifer. The area is one of rugged mountains and the population density is, and will most likely continue to be, quite low.
- Zone C consists of a highly productive, tightly confined sand and gravel aquifer. It is part of the SSA that includes zones D and E.
- Zone D is part of the SSA and is hydrogeologically similar to Zone C, except that the confining layer is leaky. Ground water discharges from the aquifer to the stream throughout most of this zone.
- Zone E is the recharge area for the SSA and is included in the designated SSA.
- Zone F consists of unconsolidated sand and is essentially the 50 year flood plain of the modern river.

Process

- <u>Step 1:</u> After discussions with the state and federal geological surveys and with resource managers, the state selects the criteria for identifying sensitive areas. The state will use hydrogeologic criteria and political criteria:
- Hydrogeologic criteria -- fractured rocks, unconsolidated sediments and sand-

stones are considered inherently sensitive.

- Political criteria -- SSAs are considered inherently sensitive.
- <u>Step 2:</u> The state maps the broad, first-round OSGWAs and determines that, based on the criteria selected in Step 1, the entire state is an OSGWA.
- <u>Step 3:</u> The state selects mitigating factors that will reduce the size of the OSGWAs. The state selects hydrogeologic factors and political factors:
- Hydrogeologic: areas that are highly confined are not sensitive.
- Political: areas with very low population density are not sensitive.
- Step 4: Second-round delineation of OSGWAs.

Based on the mitigating criteria selected in Step 3, the second-round OSGWAs consist of zones A, D, E and F.

Step 5: The State decides whether or not to continue the OSGWA-refinement process.

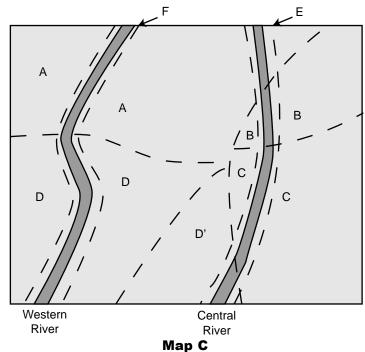
The state feels that it cannot consider additional mitigating factors, because the ones that it had chosen were believed to be the only ones meaningful for implementing the Class V Rule. The second-round OSGWA map shows that approximately half of the state is an OSGWA.

CASE STUDY: HYPOTHETICAL STATE C

Introduction

State C (Map C) consists of five sensitivity areas:

- Zone A consists of a highly productive, unconfined volcanic aquifer with a moderately deep water table. The topography is one of rolling hills. Over the last decade the population has been gradually increasing and the area is undergoing residential and commercial development.



- Zone D, D' is fairly flat,
 with a shallow water table. The aquifer is a highly productive sand and gravel.
 Zone D historically has had a very low population density and was almost entirely agricultural. However, the southeastern portion (D') is slowly undergoing urban sprawl; its population is growing and agriculture is giving way to development.
- Zone B consists of a low productivity sequence of confined silty sand layers. The population density is about the mean for the state.
- Zone C consists of a low productivity sequence of unconfined silty sand layers. The population density is very low.
- Zone E is underlain by unconfined, coarse, alluvial sediments deposited by the river that flows through the central part of the state. The aquifer is highly productive and has a shallow water table. As is often the case, there is considerable development along the river and the population density is high. (Note that the alluvial valley of the western river is deep and too narrow to be shown on the map.)
- Subzone F consist of the area where aquifers contribute ground water to the western river. (Note that Subzone F is part of, and superimposed on other zones.) The position of the boundary of the area of ground water contribution to the river, was based on the position of a roughly calculated 10-year (the same standard used in the WHP and the SWP Programs) ground water-travel time to the stream. (Note that the 10-year travel time zone is not shown for the central river; this is because the

10-year zone is totally contained in the alluvial valley and will be incorporated into the floodplain area's designation as an OSGWA, below.)

No state geologic map exists. Map C is composed of the very generalized geologic boundary information pieced together from numerous maps. The geologic boundaries shown on Map C are only approximate, because the generalized nature and the scale of this map.

- Step 1: After discussions with the state and federal geological surveys and with resource managers, the state selected the criteria for identifying sensitive areas. The state selected hydrogeologic criteria: areas with a coarse- or moderately coarse-grained, unconsolidated aquifer, or with a fractured volcanic aquifer, and areas of groundwater discharge to surface water sources of public drinking water. There are no karst aquifers or fractured aquifers, other than volcanic, in the state.
- Step 2: The state mapped the broad OSGWAs that met the selection criteria in Step 1. The OSGWA map consists of Zones A, D, E and F. In total, the OSGWA areas contain about 60% of the state.
- <u>Step 3:</u> The state then selected mitigation criteria. The state decided to apply a rational approach to reducing the size of the OSGWAs, while still protecting the most critical portions of the state from contamination by motor vehicle waste disposal wells. The mitigating factor chosen to modify the initial OSGWA map was the presence of a deep water table.
- <u>Step 4:</u> Upon applying the mitigating factors in step 3 to the first-round OSGWA map, the areas that remained OSGWAs are zone D, zone E and the southern half of subzone F, a total area of about 25% of the state.
- <u>Step 5:</u> State decided whether or not to continue the process.

The state was concerned that any further fine-tuning would result in underprotection. However, they did want to further prioritize area to be protected against motor vehicle waste disposal wells. Upon discussion of options with technical experts and resource managers, the state decided to carefully craft an additional mitigating factor. That is, the state decided to continue the process by returning to Step 3.

- <u>Step 3:</u> The state applied a final mitigating factor, very low population density (except for areas discharging ground-water to streams supplying PWSs).
- Step 4: The OSGWA map was revised to reflect the additional mitigating factor. The remaining OSGWAs (D', E and the southern half of F) appeared to be protective and, occupying only about 10% of the state, will facilitate implementation of the Cla ssV Rule.

IV. Time Line and Compliance Schedule for Delineating Other Sensitive Ground Water Areas

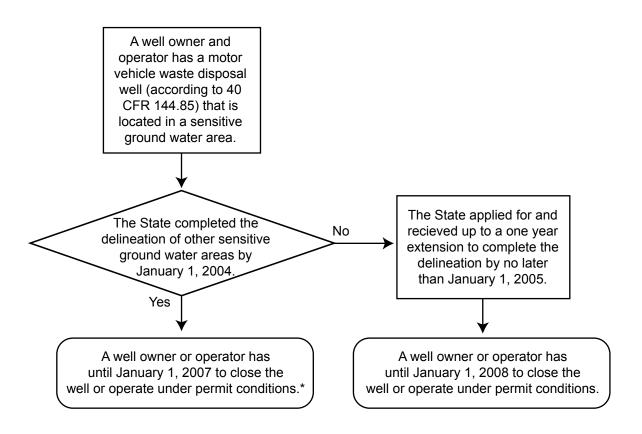
A summary of the time line for States to delineate other sensitive ground water areas is presented in the following table.

Time Line for States to Delineate Other Sensitive Ground Water Areas

Action Item	Requirement Date
Submission of Delineation Plan by Primacy State (with the Primacy Revision Package)	December 29, 2000
Application for Extending the Deadline to Delineate Other Sensitive Groun dWater Areas by States (if needed)	June 1, 2003
Completion of the Delineation of Other Sensitive Ground Water Areas by States (without the one-year extension granted by EPA)	January 1, 2004
Completion of the Delineation of Other Sensitive Ground Water Areas by States (with up to a one-year extension granted by EPA)	Up to January 1, 2005

Compliance Dates for Existing Motor Vehicle Disposal Wells in Other Sensitive Ground Water Areas

A State must complete the delineation of other sensitive ground water areas by January 1, 2004 unless it is granted a one-year extension to complete the delineation by no later than January 1, 2005.



*The well owner or operator can apply for a one-year extension if his or her compliance option is connection to a sanitary sewer or installation of new treatment technologies. On a case by case basis, the State and EPA UIC Program will consider review the application for approval. This one-year extension, however, does not apply to the permit application deadline. In addition, this one-year extension is not available when a State is granted a one-year extension to complete its delineation of other sensitive ground water areas.